

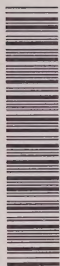
Government
Publications

Ministry
of
Energy

Honourable
Robert Welch,
Minister



Ontario



3 1761 11891800 2

WEIGHING THE OIL DROP DECISION



Energy
Ontario

April, 1982

WHY SWITCH?

Switching from oil to another home heating fuel, can save money, help Canada reduce its dependence on imported oil and help to conserve a scarce resource.

Both the Ontario and federal governments are currently encouraging homeowners to get "off-oil"—to heat with electricity, natural gas, wood, propane or other alternate fuels. Every homeowner who converts to an alternative fuel makes a significant contribution to Canada's goal of achieving crude oil self-sufficiency by 1990.

CONSERVATION FIRST

Although switching from oil to an alternative fuel helps conserve oil, homeowners should make the most efficient use of the heat they have, before investing in a new system. That means conserving energy, by insulating, weather stripping and caulking. Ministry of Energy analyses show that conservation is often the best energy investment for poorly insulated homes, hence conservation measures should be reviewed prior to a furnace conversion. By carrying out conservation measures first, the size, and therefore the cost of the heating unit required can be reduced. Keep in mind that a new heating system must be correctly sized to ensure proper performance and optimum efficiency.



The amount of money that can be saved by switching to an alternative fuel depends on a great many factors. The examples discussed here are "typical" and do not apply "across the board". When making the "off-oil" decision, remember that the rankings of different heating systems will vary as circumstances and costs change. You should also consider the non-economic factors such as unit sizes, noise and appearance.

BACKGROUND

Canada now imports about one quarter of its crude oil, at very high prices. Under the Canada-Alberta Pricing Agreement, the price of crude oil will continue to rise for some time to come. Other sources and forms of energy, such as electricity and natural gas, are also rising in price, but are almost certain to remain less expensive than oil during the 1980's and beyond. While the outlook for future oil supplies is uncertain, Canada presently has adequate supplies of natural gas and electricity.

FINANCIAL ASSISTANCE PROGRAMS

The federal government has introduced the Canada Oil Substitution Program (COSP), and the Canadian Home Insulation Program (CHIP) to provide financial assistance to homeowners who wish to convert from oil, or to upgrade the energy efficiency of their homes by adding insulation, weatherstripping, and caulking.

Ontario Hydro has developed the Residential Energy Advisory Program (REAP) which offers energy advice and loans to consumers for insulation, upgrading electrical wiring, and electric heating installations.

Gas utilities also provide information and homeowner assistance for conversion to natural gas.

ALTERNATIVES TO OIL HEATING

Homeowners who are considering a partial or complete off-oil conversion have three basic options:

- Converting from oil to another fuel,
- Supplementing oil heat with another source of heat,
- Increasing the efficiency of the existing oil furnace.

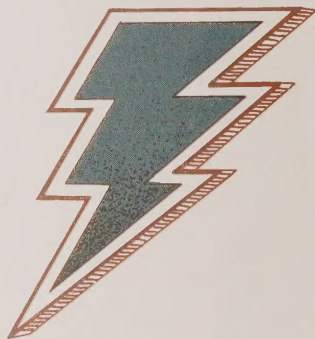
Natural gas, electricity, and, in rural areas, wood, are most commonly chosen. In regions where natural gas service is not available, a homeowner might also consider propane, particularly if natural gas service is planned for the future. Solar energy systems are also being developed but they are still too expensive for heating most Ontario homes. This will probably continue to be the case for the foreseeable future.

Most oil heating systems employ a forced air distribution network with a furnace, or hot water radiators with a boiler. In some homes oil-fired space heaters provide heat.

Each alternative fuel uses a variety of heating systems that can either replace or supplement an oil system.

ELECTRIC SYSTEMS

- **Electric baseboards:** Electric baseboard heaters can supplement or replace any oil-fired heating system. For complete replacement, electrical service will probably have to be upgraded to 200 amperes. Baseboard heaters offer two main advantages—they have virtually no maintenance costs and they allow installation of an independent thermostat to permit temperature control in each room.
- **Partial electric plenum heater:** Installed in the warm air plenum of an oil furnace, the electric plenum heater uses the existing furnace blower and ductwork to distribute the heat it produces. It can reduce oil consumption by 50 per cent or more and increases the seasonal efficiency of the oil furnace. During much of the year, it will heat an entire house on its own. Most plenum heaters are equipped with load controllers which keep the demand on the home's electrical wiring within the limits of the system. They



may, therefore, not require an electric service upgrade. Plenum heaters can be installed only in Canadian Standards Association certified furnaces. A qualified contractor can determine if your furnace can accommodate a plenum heater.

- **Electric furnace:** An oil furnace can be entirely replaced by an electric furnace. Ordinarily this requires an upgrading of the electric service.
- **Electric boiler:** An oil-fired hot water boiler can be replaced by an electric boiler. An electric service upgrade will normally be required.

CASHN
ES
-82W25

- **Add-on heat pump:** This is an electrically operated heating and cooling system that extracts heat from the outdoor air and discharges it into the furnace ducts. The heat pump provides more heat energy than the electrical energy needed to operate it. It will heat the home on its own, or at colder temperatures, will alternate with the oil furnace. At very cold temperatures (approximately -15°C) the heat pump can no longer economically extract heat from the outside air. In the summer the heat pump cools by removing heat from indoors and expelling it outside. Since heat pumps also provide the advantages of central air conditioning, installation may increase the assessed value of a house for property tax purposes.

- **All-electric heat pump:** This system replaces an oil furnace and provides full winter heating and summer cooling. It operates in the same way as the add-on heat pump, but uses built-in electric resistance elements to provide supplementary heat during very cold weather. Installation of an all-electric heat pump will probably require an upgrading of your electric service to 200 amperes. As with the add-on heat pump, the all-electric heat pump may also increase the assessed value of the house.

For further information on these and other electrical heating systems, contact your municipal electric utility, Ontario Hydro, the Ontario Electrical League, the Electrical and Electronic Manufacturers Association of Canada, or the Heating, Refrigerating and Air Conditioning Institute of Canada, each of whom can provide the names of qualified contractors or distributors in your area.

NATURAL GAS SYSTEMS

- **Natural gas conversion burner:** The burner section of an oil furnace or oil hot water boiler can often be replaced with a gas conversion burner. Gas service is installed and the oil tank is removed. If the chimney does not have a properly installed clay or metal liner, the conversion will require installation of a metal chimney liner for protection from water vapour.
- **Conventional gas furnace/boiler:** For oil furnaces and oil hot water boilers that cannot be safely converted with a replacement gas burner, replacement with a gas furnace or gas boiler is an alternative. When a new gas furnace or boiler is installed, gas service is provided and the oil tank is removed. Here again, a metal chimney liner may be required. Conventional gas furnaces are also available with intermittent ignition devices which eliminate the fuel wastage of a pilot light and a flue damper which reduces heat loss through the chimney.
- **High efficiency condensing natural gas furnace:** This, the most costly gas furnace, uses 30% to 40% less fuel to provide the same amount of heat as a conventional gas furnace. It does not require a chimney but is vented either vertically or horizontally through the wall using a small diameter (1.5-2 inch) plastic pipe. It also has a sewer connection to drain the liquid condensate it produces.
- **High efficiency condensing gas boiler:** The high efficiency condensing gas boiler is similar in concept to the condensing gas furnace. It is vented vertically or horizontally through the wall using a small diameter plastic pipe and also requires a sewer connection to drain the liquid condensate it produces.

For further information about these and other natural gas heating systems, contact a qualified natural gas heating contractor, the Heating, Refrigerating and Air Conditioning Institute of Canada, or your local gas utility. (For most of the province this means contacting Union Gas Limited, Consumers' Gas Company, or Northern and Central Gas Corporation Limited).

WOOD SYSTEMS

- **Wood stove:** If correctly sized and located, a wood stove can reduce oil consumption by at least half for many homes. Stoves that are Canadian Standards Association (CSA) or Underwriters' Laboratories of Canada (ULC) approved, are eligible for a federal COSP grant*. Particular chimney types, correct installation and regular maintenance are required for the safe operation of wood systems.
- **Wood furnaces/boilers:** Wood furnaces and boilers can replace an oil furnace. However, a house heated solely by wood cannot be left untended in cold weather without risking frozen water lines.

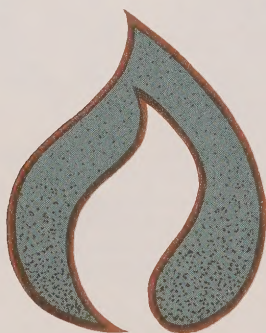
**Only air tight wood stoves qualify for a COSP grant*

Wood/electric and wood/oil furnaces are also available. These eliminate the risk of frozen water lines, as the backup system automatically takes over when the wood furnace provides insufficient heat.

Note: Some insurance companies impose a surcharge if wood heating is installed.



For further information on wood heating systems and on heating systems using propane or solar energy, contact the federal government's Conservation and Renewable Energy Office at 2242 Lakeshore Boulevard, in Metropolitan Toronto. In Toronto call 252-5866, outside Toronto call 1-800-268-2207.



MODIFICATIONS TO EXISTING OIL FURNACES

You can also reduce oil consumption by improving an existing oil furnace. Some of the more common improvements include:

- **Modified Oil Burner:** A burner with a retention head burns oil more efficiently than one with an ordinary cast iron head. Frequently, the burner nozzle required is smaller, resulting in longer burning cycles and improved seasonal efficiency.
- **New Oil Burner:** The entire oil furnace burner can be replaced by a more efficient unit, again incorporating a retention head burner with a smaller nozzle.
- **New Oil Furnace:** A furnace which is not in good condition can be replaced by a new, more efficient oil furnace.

For further information on these or other improved oil burning systems, contact a qualified oil heating contractor.

THE FINANCIAL BENEFITS OF AN OFF-OIL CONVERSION

When trying to decide which alternative is the most economical, the following questions should be asked.



A) What are the costs of each option?

B) What are the savings that result?

The costs of an option may include any of the following:

- capital cost (less federal grant, if applicable)
- removal of old equipment
- adding a chimney liner (some gas installations)
- gas connection charge (occasional)
- electric service upgrade (some electric options)
- improving ductwork
- tax re-assessment (electric heat pump options)
- maintenance costs
- fuel consumption costs
- insurance premium increases (wood options — occasional)

The savings from an option may include:

- reduced fuel demand with installation of a more efficient system
- reduced fuel costs of electricity, gas, or wood compared to oil
- reduced maintenance costs compared to an oil furnace/boiler

All costs are included in this analysis except the cost of gas connection charges, if any, ductwork modifications, insurance premium increases, and tax reassessments. Costs are based on Toronto-area prices, except in the analysis of options available to rural homeowners.

The financial benefit of each option examined below is measured in two ways:

- 1) Discounted life cycle cost
- 2) Discounted payback period.

DISCOUNTED LIFE CYCLE COST

The discounted life cycle cost of a heating system is the amount of money which, if set aside in an interest earning account prior to installation of the system, would cover all initial costs (including installation charges), as well as operating and maintenance costs over the expected life of the system. Because of the interest earned, the discounted life cycle cost is lower than the single sum of annual costs.

DISCOUNTED PAYBACK PERIOD

The discounted payback period measures the amount of time it will take to recoup the capital investment for a particular option. The homeowner who expects to move in a few years and does not expect the installation of an energy-efficient heating system to increase the value of the house, may prefer this measure.



Since the heating needs of a house significantly affect the financial attractiveness of various options, both life cycle costs and payback periods are measured at several oil consumption levels. A typical oil-heated

Toronto house consumes 3000 to 4000 litres of oil per year.

Other factors affecting the financial attractiveness of alternative systems include:

- the fuel-burning efficiency of various heating systems
- the estimated future cost of alternative fuels (gas, electricity, wood)
- the timing of the savings (other things being equal, immediate savings are more desirable than future savings)
- the assumed life span of the systems.

RURAL HOMEOWNERS

Rural homeowners often face a different set of alternatives for an off-oil decision. Frequently, natural gas is not available; on the other hand, wood usually is available and at prices that are considerably lower than those charged to urban homeowners. In such cases, wood is financially attractive as a partial or complete alternative to oil. If the homeowner gets his own wood rather than having it delivered, the financial advantages of using wood are even greater.



Electrical alternatives to oil heating are slightly more costly in rural areas than in urban areas; nevertheless, most electrical alternatives offer savings similar to those which appear in Tables 2 and 5.

NOTE: The results presented in the following pages are for illustrative purposes only. *No two situations are identical.* The life cycle costs of various options, both actual and relative to one another, will vary from one part of Ontario to another, and depend on assumptions regarding capital cost, fuel prices, equipment life spans and many other factors.

Case 1: Oil Fired Forced Warm Air System:

A list of the options examined appears in Table 1; the list is not exhaustive but includes most options currently available to urban homeowners. A separate assessment of rural heating alternatives is provided at the end of this section. Note that a homeowner should consider certain options (marked with an asterisk) only if the existing oil furnace is in good condition.

Table 2 shows approximate life cycle costs for all options at various oil consumption levels.

When interpreting Table 2, you should remember that:

- Heat pumps also provide air conditioning. If you intend to install air conditioning, the heat pump is more attractive than would otherwise be the case. The 15-year life cycle cost of central air conditioning is about \$3,100. The additional cost of air conditioning with a heat pump is about \$700–\$1,000 over 15 years.
- The capital costs of some options may decrease in future years. The high-efficiency gas furnace is an example. The cost of electric

- heating systems will also drop if load controllers can eliminate the need for a service upgrade.
- The cost of an electric baseboard system is quite variable. It depends on the size and design of the house.
 - Heating with wood is costly for most urban homeowners. Rural heating is dealt with separately.
 - Some systems such as electric baseboards, the conventional gas furnace, the electric furnace, and most boiler systems, can be expected to last more than 15 years.

CASE 1: FORCED WARM AIR HEATING SYSTEMS

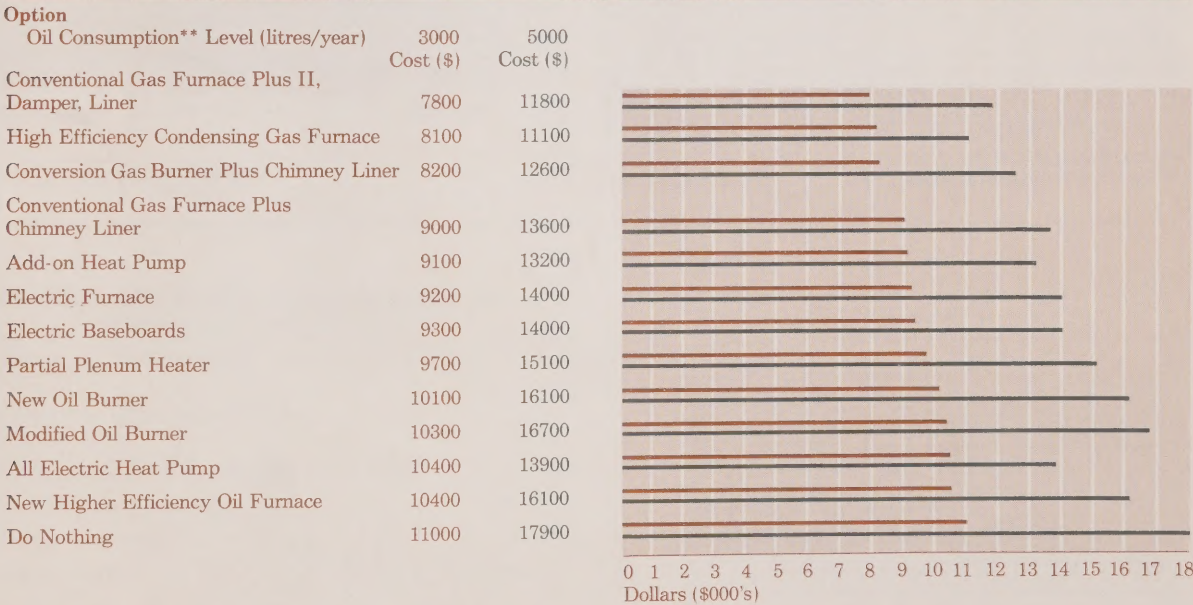
TYPICAL COST OF PURCHASE AND INSTALLATION***

TABLE 1: OPTIONS EXAMINED	Oil Consumption**Level (litres/years)	3000	5000
		Cost (\$)	Cost (\$)
Conversion Gas Burner Plus Chimney Liner*		571	571
Conventional Gas Furnace Plus Chimney Liner		914	914
Conventional Gas furnace Plus Intermittent Ignition, (II) Flue Damper, Chimney Liner		1369	1369
High Efficiency Condensing Gas Furnace		2444	2444
Electric Baseboards		2019	2019
Partial Plenum Heater*		800	800
Electric Furnace		1744	1744
Add-On Heat Pump*		2294	2794
All Electric Heat Pump		4569	5094
Modified Oil Burner*		200	200
New Oil Burner*		400	400
New Higher Efficiency Oil Furnace		1300	1300
Do Nothing*		0	0

*SHOULD BE USED ONLY IF EXISTING HEATING SYSTEM IS IN GOOD CONDITION
**1 litre = 0.22 Imperial gallons

***NOTE: Actual costs may differ from these.
All costs shown net after tax grant.

TABLE 2: FORCED WARM AIR HEATING SYSTEMS
Discounted 15-Year Life cycle Costs*



*Costs shown include capital, operating, and maintenance costs.
**1 litre = 0.22 Imperial gallons

Table 3 shows the discounted payback period for each option at various consumption levels. Note that the payback period decreases as consumption increases.

Options with short payback periods are *not* necessarily the cheapest in the long term. For example, a gas conversion burner pays for itself in less than a year at high consumption levels, but is more expensive than a high efficiency gas furnace over a 15 year span. Clearly the gas furnace is better in the long term under these circumstances—not only does it have lower total costs, which is good for the homeowner, but it consumes less fuel, which is good for everyone.

TABLE 3: FORCED WARM AIR HEATING SYSTEMS
Discounted Payback Periods



*Less than one year.
**1 litre = 0.22 Imperial gallons

Case 2: Oil Fired Hot Water System:

Table 4 shows the options examined as alternatives to an oil fired hot water system. Again, the list is not exhaustive—homeowners should contact a qualified heating contractor to determine if other options are available in their area. Approximate life cycle costs at various consumption levels are displayed in Table 5. Note that:

- 1. Most alternatives to oil heating again offer financial benefits.
- 2. As with a forced air system, the financial benefits increase with consumption level.
- 3. As consumption levels increase, high-efficiency alternatives become relatively more attractive.
- 4. As mentioned previously, the cost of an electric baseboard system is quite variable; hence the relative attractiveness of a baseboard system will vary among houses.

Table 6 shows discounted payback periods for hot water system alternatives. Again, the payback period of each alternative decreases as the oil consumption level increases. The option with the shortest payback period is frequently *not* the cheapest option in the long run.

CASE 2: HOT WATER HEATING SYSTEMS

TYPICAL COST OF PURCHASE AND INSTALLATION*

TABLE 4: OPTIONS EXAMINED	Oil Consumption* Level (litres/years)	3000	5000
		Cost (\$)	Cost (\$)
Electric Boiler		1944	1944
Electric Baseboards		2019	2019
Gas Conversion Burner (Boiler), Chimney Liner		718	718
Conventional Gas Boiler, Chimney Liner		1244	1244
High Efficiency Gas Boiler		2444	2944
Do Nothing		0	0

*NOTE: Actual costs may differ from these. All costs shown net of Taxable grants.

TABLE 5: HOT WATER HEATING SYSTEMS Discounted 15-Year Life Cycle Costs

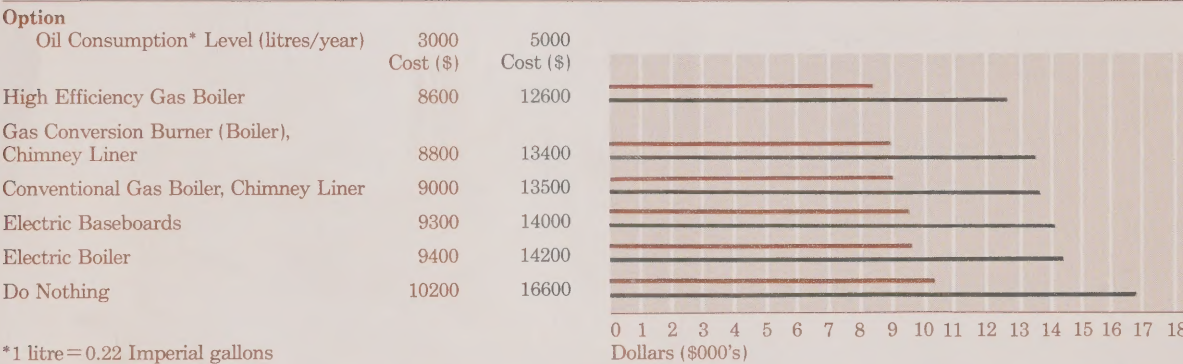


TABLE 6: HOT WATER HEATING SYSTEMS Discounted Payback Periods



CONCLUSIONS

The benefits of an off-oil decision can be substantial, both financially and as a contribution to attaining our national energy goals. The alternative or supplementary heating system you choose will depend on you, the state of your current oil heating system, the availability of alternate fuels, your preferences regarding fuels and systems, whether or not you want air conditioning, the capital costs of the various heating systems and a variety of other considerations.

If you want to upgrade your system, first ensure that your house is well insulated, weatherstripped and caulked. You should also take advantage of all eligible programs, outlined below, that are offered by the federal government, Ontario Hydro, and the natural gas utilities.

CANADA OIL SUBSTITUTION PROGRAM (COSP)

Under this program, the federal government offers taxable grants to homeowners and businesses converting from oil to an alternative fuel for space heating and water heating.

In Ontario, eligible alternatives include electricity, natural gas, propane, wood, wind, solar, coal and peat.

The taxable grant covers 50 per cent of eligible conversion costs up to a maximum grant of \$800. The program is effective for conversions made on or after October 28, 1980, until December, 1990.

Partial conversions that supplement oil-fired equipment (for example, plenum heaters, add-on heat pumps or air-tight wood stoves) are also eligible if they reduce annual oil consumption by at least 50 per cent.

Application forms are available from the gas utilities for gas conversions, public utility commissions for electric conversions, and qualified heating contractors or the Department of Energy, Mines and Resources (416-252-5866 or 1-800-268-2207) for all other conversions.

For more information, call your local gas or electrical utility or the Ministry of Energy at Zenith 8-0420 (outside Toronto) and ask for 965-0863.

In Toronto call 965-0863.

RESIDENTIAL ENERGY ADVISORY PROGRAM (REAP)

Under this program, Ontario Hydro and municipal electrical utilities advise homeowners on ways to make the home more energy-efficient and will lend up to \$2,000, at interest rates close to the Ontario Hydro borrowing rate to:

- generally improve a home's energy efficiency;
- improve home insulation;
- upgrade electrical wiring;
- convert heating systems wholly or partially to electrical heating.

Ontario Hydro and most municipal utilities will:

- assess the home's insulation, ventilation, weather sealing and electrical wiring needs;
- help homeowners take full advantage of federal assistance plans such as CHIP (Canadian Home Insulation Program) and COSP (Canada Oil Substitution Program);
- locate qualified contractors for energy conservation or electrical heating projects;
- conduct a follow-up survey, if required, when the work is completed.

Homeowners must first use any applicable COSP or CHIP grants, and pay \$200 of the remaining cost, before becoming eligible for a REAP loan, which will be repayable over a period of up to five years.

This is one of the important initiatives of the Ontario government's Board of Industrial Leadership and Development (BILD) strategy, which stresses the importance of conservation and the wise use of electrical energy to Ontario's economic future.

The energy advisory program began in the fall of 1981 and will eventually spread throughout Hydro's rural service area. Municipal electric utilities have the authority to undertake similar programs in their service areas, and many have decided to do so.

For further information, call Ontario Hydro at 592-3815 in Toronto, or your municipal electric utility or public utilities commission.

CANADIAN HOME INSULATION PROGRAM (CHIP)

This federal program provides taxable grants of up to \$500 to homeowners who insulate or weatherize homes built before 1971.

The grant is divided into two parts:

- up to \$350 for approved materials;
- one-third of labor costs up to \$150.

For more information regarding CHIP call 789-0581 in Metropolitan Toronto; 1-800-268-1818 toll-free in other areas of the province.

ASSISTANCE FROM GAS UTILITIES

Natural gas utilities in Ontario also provide information and assistance to homeowners for off-oil conversions and energy conservation. These utilities will:

- help homeowners take full advantage of federal assistance plans such as CHIP (Canadian Home Insulation Program) and COSP (Canada Oil Substitution Program);
- locate qualified contractors for natural gas heating projects;
- finance conversions with repayment on the monthly gas bill;
- offer conservation improvement packages and financing for these packages (varies from utility to utility);
- conduct a follow-up inspection when the work is completed.



Ontario

Ministry
of
Energy

Honourable
Robert Welch,
Minister



Energy
Ontario

